From:	Jay Field
To:	Burt Shephard/R10/USEPA/US@EPA; Eric Blischke/R10/USEPA/US@EPA
Cc:	Joe Goulet/R10/USEPA/US@EPA; rgensemer@parametrix.com; mesl@shaw.ca; Robert Neely
Subject:	Recalculated table
Date:	03/09/2009 01:17 PM
Attachments:	PH_Tox_RefStations_090309.xls

Eric & Burt,
attached is the re-calculated spreadsheet. Results for 4 stations with replicated bioassays were averaged. N=17 reference stations.
5th percentile values, level 1 & level 2 were calculated acccording to this mornings discussion. I also included the calculations based on average reference results for comparison.
Jay

Shephard.Burt@epamail.epa.gov wrote:

> Hello all,?
>
> We're on to have a short call with Don MacDonald at 10 am this morning,
> Monday, March 9th to go over and clarify the current status of the reference envelope calculations for Portland Harbor. The attached e-mail chain contains the latest information I have regarding the reference envelope discussions.
>
> Call in n the Portland Harbor TCT line: Non-Responsive , passcode Non-Responsiv
> Best regards,
>
> Burt Shephard
> Risk Evaluation Unit
> Office of Environmental Assessment (OEA-095)
> U.S. Environmental Protection Agency, Region 10
> 1200 6th Avenue
> Seattle, WA 98101
>
> Telephone: (206) 553-6359
> Fax: (206) 553-0119
>
> e-mail: Shephard.Burt@epa.gov
>
> "If your experiment needs statistics to analyze the results, then you
> ought to have done a better experiment"
> - Ernest Rutherford
> ----- Forwarded by Burt Shephard/R10/USEPA/US on 03/09/2009 09:51 AM -----
>
> | | | |
> |---|---|---|
> | | Eric Blischke/R10/USEPA/US | |
> | To | | mesl@shaw.ca |
> | | 03/02/2009 01:56 PM | |
> | cc | | Burt Shephard/R10/USEPA/US@EPA, jay.field@noaa.gov, Chip Humphrey/R10/USEPA/US@EPA |
> | Subject | | Fw: Development of Reference Envelope for the Evaluation of Benthic Risk |

Don, here is what I sent to the LWG in response to the email exchange between you, Jay and I. Late Friday, I received a voice mail from John Toll. Basically, John agreed with item 1. However, he disagreed with item 2. He quotes from Appendix E2 of the Calcasieu BERA (found numerous times on pages 31 - 35) that the determination of low and high toxicity for a given endpoint should be made "relative to the lower 95% prediction limit for the [endpoint] that was observed at selected reference sites" not the mean. Note that Appendix E2 was referenced on page 22 of the Portland Harbor benthic risk evaluation memo.

To be honest, this seems to make more sense to me to avoid, in the Hyalella biomass instance, having a low toxicity effect biomass threshold greater than the reference envelope (79.0% vs 74.5%). Can you provide some additional illumination?

Thanks, Eric
----- Forwarded by Eric Blischke/R10/USEPA/US on 03/02/2009 01:43 PM -----

	Eric Blischke/R10/USEPA/US	
To		Bob Wyatt
	02/25/2009 04:34 PM	
cc		johnt@windwardenv.com, Burt Shephard/R10/USEPA/US@EPA, Chip Humphrey/R10/USEPA/US@EPA, jay.field@noaa.gov
Subject		Development of Reference Envelope for the Evaluation of Benthic Risk

Bob, during the sediment conference in Jacksonville, John Toll, Jay Field and I discussed the development of the reference envelope for the evaluation of benthic risk. At that time, we agreed that EPA would develop some additional clarity about what our concerns were given that the LWG was following the procedures outlined in the benthic evaluation framework developed by Don MacDonald and Peter Landrum. I think we have

boiled it down to two questions - establishment of the benthic envelope
and evaluating sediment toxicity results relative to the reference envelope. I have tried to provide my understanding of these issues
below:

1) Establishment of the reference envelope: This step is described in
Section 4.4 of MacDonald and Landrum: "While several procedures can be
used to calculate the reference envelope, we recommend calculating the
lower limit of the reference envelope as the 5th percentile of the control-adjusted response data for each toxicity test and endpoint. It
is recommended that the response data be log-transformed prior to calculating the 5th percentile response level. The normal range of reference responses spans the range from the 5th percentile value to the
maximum value in the data set." In the attached spreadsheet, a 5th
percentile of response level is calculated as 74.5% for the Hyalella
biomass endpoint.

Please confirm that this is the general procedure that you will be following recognizing that different software packages will return different values for the 5th percentile.

2) Identifying samples as toxic or non-toxic: This step is also described in Section 4.4 of MacDonald Landrum: "Designate sediment
samples with control-adjusted effect values lower than the lower limit
of the normal range of control-adjusted responses in reference samples
(i.e., lower than the 5th percentile) as toxic for the endpoint under
consideration." These procedures our less well defined. MacDonald and
Landrum specify a 10% and 20% difference in response rate for establishing low risk and high risk thresholds as stated in Section 4.7:

> These low risk toxicity thresholds were established at COPC/COPC
> mixture concentrations that corresponded to a 10% increase in the
> magnitude of toxicity to selected toxicity test organisms, relative
> to the average response rates for toxicity test organisms exposed to
> reference sediment samples.
> These high risk toxicity thresholds were established at COPC/COPC
> mixture concentrations that corresponded to a 20% increase in the
> magnitude of toxicity to selected toxicity test organisms, relative
> to the average response rates for toxicity test organisms exposed to
> reference sediment samples.

In the attached spreadsheet, the 10% and 20% difference is calculated as
79.0% and 70.2% respectively. These toxicity thresholds (TT) are applied to samples for which we have chemistry data only (i.e., to predict presence or absence of toxicity for a toxicity test endpoint).
However, before a TT is selected, it is evaluated to determine if it can
be used to reliably classify samples as toxic or not toxic considering
multiple endpoints.

Please confirm that this is the general procedure that you will be following.%

We are interested in confirming these procedures consistent with our
agreements regarding check-ins on the BERA and to avoid confusion regarding the appropriate procedures to follow.

Thanks, Eric

(See attached file: PH_Tox_RefStations_090212.xls)

----- Forwarded by Burt Shephard/R10/USEPA/US on 03/09/2009 09:51 AM -----

Eric Blischke/R10/USEPA/US	
To	John Toll <JohnT@windwardenv.com>
03/03/2009 12:25 PM	
cc	Burt Shephard/R10/USEPA/US@EPA, Chip Humphrey/R10/USEPA/US@EPA, "jay.field@noaa.gov" <jay.field@noaa.gov>, "rjw@nwnatural.com" <rjw@nwnatural.com>
Subject	RE: Development of Reference Envelope for the Evaluation of Benthic Risk(Document link: Burt Shephard)

John, I have a note into Don MacDonald regarding item number 2 below
based on your earlier voicemail. Thanks for the follow-up email.

Eric,

John Toll <JohnT@windwardenv.com>	
To	Eric Blischke/R10/USEPA/US@EPA, "rjw@nwnatural.com" <rjw@nwnatural.com>
03/03/2009 11:52 AM	
cc	Burt Shephard/R10/USEPA/US@EPA, Chip Humphrey/R10/USEPA/US@EPA, "jay.field@noaa.gov" <jay.field@noaa.gov>

Subject of

RE: Development of Reference Envelope for the Evaluation Benthic Risk

Hi Eric. As promised I'm following up in writing on my voice-mail from late Friday regarding your February 25 e-mail (below). You listed two issues and provided your understanding of those issues, and asked us to confirm your understanding. I replied verbally in my Friday voice-mail; this e-mail just puts those replies in writing for the record.

1) Establishment of the reference envelope. Yes, this is the general procedure that we're following, recognizing that different software packages return different values for the 5th percentile.

2) Identifying samples as toxic or non-toxic. As you've discovered the specific procedure for identifying samples as toxic or non-toxic isn't completely explicated in Section 4.7 (or elsewhere) of the MacDonald & Landrum report; instead they cite MacDonald et al. (2003), which is a document describing the development and evaluation of PRGs for Calcasieu Estuary. We went to the source document (specifically MacDonald et al. (2003) Appendix E2 - Assessment of Risks to the Benthic Invertebrate Community, pp. 28-36) to find the procedure. The procedure uses the lower 95% prediction limit for the reference sites as the "reference envelope value." Specifically, for each bioassay endpoint they calculated a 95% two-tailed prediction interval for the average (across sediment sample replicates) response rate. The lower 95% prediction limit for the reference sites is the lower end of that prediction interval, which is the 2.5th percentile of the reference response distribution. (Note that we've agreed to use the lower 5th percentile, which is a little bit more conservative than the Calcasieu procedure). They then added 10% to the lower 95% prediction limit to get the low toxicity threshold, and 20% to the lower 95% prediction limit to get the high toxicity threshold. The MacDonald et al. procedure is different in two ways from what you described in your e-mail. First, it uses the lower 95% prediction limit where you used the reference area average as the reference envelope value. Second, it adds 10% and 20% to the reference envelope value, whereas you added 10% and 20% of the reference envelope value to the reference envelope value.

So, the short answer to your question about the procedure for identifying samples as toxic or non-toxic is no, we didn't follow the general procedure described in your 2/25 e-mail, we followed the MacDonald et al. (2003) procedure that was cited in Section 4.7 of MacDonald and Landrum (2008), except that by agreement we used the lower 5th, percentile instead of the lower 2.5th percentile, which is a little bit more conservative than what was done for the Calcasieu.

John

John Toll, Ph.D.
Partner
Windward Environmental LLC
200 West Mercer Street, Suite 401
Seattle, WA 98119-3958
(206) 812-5433
(206) 913-3292 (cell)
www.windwardenv.com

-----Original Message-----
From: Blischke.Eric@epamail.epa.gov [mailto:Blischke.Eric@epamail.epa.gov]
Sent: Wednesday, February 25, 2009 4:34 PM
To: rjw@nwnatural.com
Cc: John Toll; Shephard.Burt@epamail.epa.gov; Humphrey.Chip@epamail.epa.gov; jay.field@noaa.gov
Subject: Development of Reference Envelope for the Evaluation of Benthic Risk

Bob, during the sediment conference in Jacksonville, John Toll, Jay Field and I discussed the development of the reference envelope for the evaluation of benthic risk. At that time, we agreed that EPA would develop some additional clarity about what our concerns were given that the LWG was following the procedures outlined in the benthic evaluation framework developed by Don MacDonald and Peter Landrum. I think we have boiled it down to two questions - establishment of the benthic envelope and evaluating sediment toxicity results relative to the reference envelope. I have tried to provide my understanding of these issues below:

1) Establishment of the reference envelope: This step is described in

Section 4.4 of MacDonald and Landrum: "While several procedures can be used to calculate the reference envelope, we recommend calculating the lower limit of the reference envelope as the 5th percentile of the control-adjusted response data for each toxicity test and endpoint. It is recommended that the response data be log-transformed prior to calculating the 5th percentile response level. The normal range of reference responses spans the range from the 5th percentile value to the maximum value in the data set." In the attached spreadsheet, a 5th percentile of response level is calculated as 74.5% for the Hyalella biomass endpoint.

Please confirm that this is the general procedure that you will be following recognizing that different software packages will return different values for the 5th percentile.

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In the attached spreadsheet, the 10% and 20% difference is calculated as 79.0% and 70.2% respectively. These toxicity thresholds (TT) are applied to samples for which we have chemistry data only (i.e., to predict presence or absence of toxicity for a toxicity test endpoint). However, before a TT is selected, it is evaluated to determine if it can be used to reliably classify samples as toxic or not toxic considering multiple endpoints.

Please confirm that this is the general procedure that you will be following.

We are interested in confirming these procedures consistent with our agreements regarding check-ins on the BERA and to avoid confusion regarding the appropriate procedures to follow.

Thanks, Eric

(See attached file: PH_Tox_RefStations_090212.xls)

----- Forwarded by Burt Shephard/R10/USEPA/US. on 03/09/2009 09:51 AM -----

"MESL" <mesl@shaw.ca>

To: Eric Blischke/R10/USEPA/US@EPA

03/03/2009 02:37 PM

cc: Burt Shephard/R10/USEPA/US@EPA, <jay.field@noaa.gov>, Chip Humphrey/R10/USEPA/US@EPA, "Robert W. Gensemer" <rgensemer@parametrix.com>

Subject: RE: Development of Reference Envelope for the Evaluation of Benthic Risk

Eric:

John Toll is correct. We calculated our T10 and T20 values from the lower limit of the reference envelope (rather than the mean response rate for reference samples) in the Calcasieu BERA. While I believe that this approach is reasonable, we have since re-evaluated the procedures and now target the mean for reference samples as the basis for establishing the T10 and T20 values. I apologize for not remembering that we had used the older procedure in the Calcasieu BERA. You are right, it is cleaner in this case to have agreement between the toxicity designations (made using the reference envelope) and the Level 1 response values agree.

With the LWG interpretation of our guidance, it creates multiple interpretations of the toxicity of each sediment sample, as follows:

Response Interpretation
LLRE (1) Sample

considered to be not toxic relative to the endpoint considered

< LLRE; but > Level 1 Sample considered to be
toxic for endpoint considered; risk to benthic invertebrates considered
to be low

< Level 1; but > Level 2 Sample considered to be moderately toxic for endpoint considered; risk to benthic invertebrates considered to be moderate

Level 2
Sample

considered to be highly toxic to endpoint considered; risk to benthic
invertebrates considered to be high

(1) LLRE = lower limit if reference envelope

For all of these outcomes, the management decision will usually be based
on multiple lines of evidence. For many samples, we will have only one
line of evidence upon which to base a management decision. This underlines the importance of developing toxicity thresholds that correspond to Level 1 or Level 2 effects levels and evaluating their
reliability in terms of correctly classifying sediment samples as toxic
and not toxic (as illustrated in our TSMD report). I can't over-emphasize the importance of these additional steps in the process..

Cheers,
Don

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24-4800 Island Hwy N
Nanaimo, BC V9T 1W6
250-729-9625 (general); 729-9623 (Don); 729-9628 (Fax)

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